

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

|                                                                            |                                                                |
|----------------------------------------------------------------------------|----------------------------------------------------------------|
| Date of mailing (day/month/year)<br>04 July 2000 (04.07.00)                |                                                                |
| International application No.<br>PCT/US99/21874                            | Applicant's or agent's file reference<br>GIC-PT079PC           |
| International filing date (day/month/year)<br>21 September 1999 (21.09.99) | Priority date (day/month/year)<br>21 September 1998 (21.09.98) |
| Applicant<br>CUCINOTTA, Anthony                                            |                                                                |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

19 April 2000 (19.04.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Henrik Nyberg

Telephone No.: (41-22) 338.83.38

Best Available Copy

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

VOLPE, Anthony, S.  
Volpe and Koenig, P.C.  
400 One Penn Center  
1617 John F. Kennedy Boulevard  
Philadelphia, PA 19103  
ETATS-UNIS D'AMERIQUE

|                                                                 |                                                                            |
|-----------------------------------------------------------------|----------------------------------------------------------------------------|
| Date of mailing (day/month/year)<br>01 February 2001 (01.02.01) | IMPORTANT NOTIFICATION                                                     |
| Applicant's or agent's file reference<br>GIC-PT079PC            |                                                                            |
| International application No.<br>PCT/US99/21874                 | International filing date (day/month/year)<br>21 September 1999 (21.09.99) |

## 1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

|                                                                                                                         |                            |                          |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|
| Name and Address<br>CUCINOTTA, Anthony<br>1525 Latigo Hills Trail<br>Flower Mound, TX 75022<br>United States of America | State of Nationality<br>** | State of Residence<br>US |
|                                                                                                                         | Telephone No.              |                          |
|                                                                                                                         | Facsimile No.              |                          |
|                                                                                                                         | Teleprinter No.            |                          |

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☐ the address ☒ the nationality ☐ the residence

|                                                                                                                         |                            |                          |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|
| Name and Address<br>CUCINOTTA, Anthony<br>1525 Latigo Hills Trail<br>Flower Mound, TX 75022<br>United States of America | State of Nationality<br>US | State of Residence<br>US |
|                                                                                                                         | Telephone No.              |                          |
|                                                                                                                         | Facsimile No.              |                          |
|                                                                                                                         | Teleprinter No.            |                          |

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

|                                                                            |                                                                   |
|----------------------------------------------------------------------------|-------------------------------------------------------------------|
| <input checked="" type="checkbox"/> the receiving Office                   | <input type="checkbox"/> the designated Offices concerned         |
| <input type="checkbox"/> the International Searching Authority             | <input checked="" type="checkbox"/> the elected Offices concerned |
| <input type="checkbox"/> the International Preliminary Examining Authority | <input type="checkbox"/> other:                                   |

|                                                                                               |                                                                       |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br>Sean Taylor<br>Telephone No.: (41 22) 338 93 38 |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|                                                                                           |                                                                                                                               |                                              |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Applicant's or agent's file reference<br>J.                                               | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |                                              |
| International application No.<br>PCT/US99/21874                                           | International filing date (day/month/year)<br>21/09/1999                                                                      | Priority date (day/month/year)<br>21/09/1998 |
| International Patent Classification (IPC) or national classification and IPC<br>H04N7/088 |                                                                                                                               |                                              |
| Applicant<br>GENERAL INSTRUMENT CORPORATION                                               |                                                                                                                               |                                              |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

|                                                                                                                                                                                                                                                                                     |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date of submission of the demand<br><br>19/04/2000                                                                                                                                                                                                                                  | Date of completion of this report<br><br>19.12.2000                                                                                                                 |
| Name and mailing address of the international preliminary examining authority:<br> European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized officer<br><br>Zanella, C<br><br>Telephone No. +49 89 2399 8960<br> |

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US99/21874

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

### Description, pages:

|       |                     |            |                |            |
|-------|---------------------|------------|----------------|------------|
| 1,3-8 | as originally filed |            |                |            |
| 2     | as received on      | 18/10/2000 | with letter of | 18/10/2000 |

### Claims, No.:

|      |                |            |                |            |
|------|----------------|------------|----------------|------------|
| 1-17 | as received on | 18/10/2000 | with letter of | 18/10/2000 |
|------|----------------|------------|----------------|------------|

### Drawings, sheets:

|         |                     |
|---------|---------------------|
| 1/2,2/2 | as originally filed |
|---------|---------------------|

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/US99/21874

- ☒ the description, pages: 2  
☒ the claims, Nos.: 1-24  
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |      |        |      |
|-------------------------------|------|--------|------|
| Novelty (N)                   | Yes: | Claims | 1-17 |
|                               | No:  | Claims |      |
| Inventive step (IS)           | Yes: | Claims | 1-17 |
|                               | No:  | Claims |      |
| Industrial applicability (IA) | Yes: | Claims | 1-17 |
|                               | No:  | Claims |      |

2. Citations and explanations  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**ITEM V**

The claimed subject-matter refers to a method and apparatus for merging lines of data of vertical blanking intervals of two different services. To this end a device comprising four memories operating in a kind of ping pong fashion is used. The method claimed by claim 1 is not suggested in the prior art, as well as the architecture of the device claimed by claim 5. In the nearest prior art disclosed by document GB-A-2 286 321 merging of data could for example be provided by data assembler 44 using mainly headers, linkers and pointers, that is in a manner substantially different from the claimed device which makes use of direct writing into and reading from four memories.

The claimed subject matter is therefore considered as involving an inventive step.

The presently claimed subject-matter relates to the field of electronics and in particular to the design of electronic devices which are then manufactured by the industry. The present claims possess thus industrial applicability.

**ITEM VIII**

Claim 5 is drafted in a vague manner since it merely lists some components parts of the device shown by figure 1 and does not give sufficient information to the person skilled in the art on the manner in which the claimed apparatus should operate; from this claim it is not even clear whether data from "a first service input " should be merged with data from "a second service input". This claim therefore does not meet the requirements of Article 6 PCT. It appears that the clarifications needed for claim 5 are included in the subject-matter of claim 13.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/US99/21874

The subject-matter of claim 8 is already included in that of claim 5 and therefore claim 8 is redundant.

# PATENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

VOLPE, A.  
VOLPE & KOENIG, P.C.  
Suite 400, One Penn Center  
1617 John F. Kennedy Boulevard  
Philadelphia, PA 19103  
ETATS-UNIS D'AMERIQUE

RECEIVED

AM/PM

AUG 01 2000

VOLPE & KOENIG, P.C.

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing  
(day/month/year)

19.07.2000

Applicant's or agent's file reference

1. *MOT-D2194 W6*

REPLY DUE

within 3 month(s)  
from the above date of mailing

International application No.

PCT/US99/21874

International filing date (day/month/year)

21/09/1999

Priority date (day/month/year)

21/09/1998

International Patent Classification (IPC) or both national classification and IPC

H04N7/088

Applicant

GENERAL INSTRUMENT CORPORATION

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain document cited
  - VII ☒ Certain defects in the international application
  - VIII ☒ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

**When?** See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also:** For an additional opportunity to submit amendments, see Rule 66.4.  
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.  
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 21/01/2001.

**DOCKETED FOR**

*10/19/00 Response*

Name and mailing address of the international preliminary examining authority:

 European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

Zanella, C

Formalities officer (incl. extension of time limits)

SCHALINATUS, D

Telephone No. +49 89 2399 8242





## WRITTEN OPINION

International application No. PCT/US99/21874

### I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*):

#### Description, pages:

1-8 as originally filed

#### Claims, No.:

1-24 as originally filed

#### Drawings, sheets:

1/2-2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

### V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

|                               |             |
|-------------------------------|-------------|
| Novelty (N)                   | Claims      |
| Inventive step (IS)           | Claims 1-24 |
| Industrial applicability (IA) | Claims      |

2. Citations and explanations

see separate sheet

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**ITEM V**

Reference is made to the following document:

D1: GB-A-2 286 321 (VIDEOTRON GROUPE LTEE) 9 August 1995 (1995-08-09)

The present set of claims lacks clarity (see item VIII). However, insofar as the claimed subject-matter is understood, it appears that the documents of the search report do not constitute a specific obstacle to the patentability of the claims. In particular it appears for example that in document D1 a merging of data could be provided by data assembler 44 using mainly headers, linkers and pointers, i.e. in a manner conceptually different from that suggested by the present application, consisting in direct writing and reading from four memories. The claimed subject-matter appears thus to be based on the use of an inventive step.

**ITEM VII**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant prior art disclosed in document D1 is not mentioned in the description, nor is this document identified therein.
2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

**ITEM VIII**

1. Although claims 5 and 13 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness. Hence, claims 5 and 13 do not meet the requirements of Article 6 PCT. In order to overcome this objection, it would appear appropriate to file an amended set of claims defining the relevant subject-matter in terms of a single independent claim directed to an "apparatus", followed by dependent claims covering features which are merely optional (Rule 6.4 PCT).

2. It is further noted that claim 5 is drafted in a rather speculative manner since it merely lists the component parts which are included in the claimed device and does not give any indication of the manner in which the claimed apparatus should operate. Its dependent claims 6-12 also do not arrive at a clarification of the subject-matter. Since claims 5-12 do not set out the features which are essential to the definition of the invention they do not meet the requirements of Article 6 PCT.

3. The subject-matter of claim 13 is not fully clear since the claim is drafted in a vague manner and includes terms of undefined meaning (see "service"; "data" being indifferently written or read from the memories). This claim therefore does not meet the requirements of Article 6 PCT.



EPA/EPO/OEB  
D-80298 München  
+49 89 2399-0  
TX 523 656 epmu d  
FAX +49 89 2399-4465

Europäisches  
Patentamt

Generaldirektion 2

European  
Patent Office

Directorate General 2

Office européen  
des brevets

Direction Générale 2

## Correspondence with the EPO on PCT Chapter II demands

In order to ensure that your PCT Chapter II demand is dealt with as promptly as possible you are requested to use the enclosed self-adhesive labels with any correspondence relating to the demand sent to the Munich Office.

One of these labels should be affixed to a prominent place in the upper part of the letter or form etc. which you are filing.

09/787601

JG10 Rec'd PCT/PTO 21 MAR 2001

IN THE INTERNATIONAL  
PRELIMINARY EXAMINATION AUTHORITY

In the PCT APPLICATION of:

General Instrument Corporation

Application No.: PCT/US99/21874

Filed: 21 September 1999

For: APPARATUS AND METHOD FOR  
MERGING VERTICAL BLANKING  
INTERVALS

Authorized Officer: C. Zanella

Our File: MOT-D2194WO  
(Formerly GIC-PT079PC)

Date: 18 October 2000

12 PAGES VIA FACSIMILE  
TO 011-49-89-2399-4465  
ORIGINAL TO FOLLOW  
VIA DHL

REPLY TO WRITTEN OPINION WITH ARTICLE 34 AMENDMENT

IPEA-EPO  
Erhardtstr. 27  
D-80298 Munich  
GERMANY

Sir:

This Reply is responsive to the 19 July 2000 Written Opinion. Pursuant to Article 34, please amend the application by substituting new page 2 in the specification for original page 2; and new pages 9-13 in the claims for original pages 9-13.

New page 2 discloses document D1 (Patent Application No. GB A 2 286 321) as required under Item VII.1 of the Written Opinion. New pages 9-13 contain a substitute set of claims 1-17 which have been amended to add reference signs in parentheses in compliance with Item VII.2 of the Written Opinion. Original claims 5, 6, 10, 11, 12, 13, 16, 20, 23 and 24 have also been amended to address the requirements of Article 6 PCT as cited by the Examiner in Item VIII of the Written Opinion. Since original claims 14, 15, 17-19, 21 and 22 have been cancelled, the claims have been renumbered as new claims 1-17. A printout of the claims showing additions as underlined and deletions as bracketed is also enclosed.

It is respectfully submitted that the specification and claims address all of the Examiner's findings in the Written Opinion and that the pending claims satisfy the

Application No.: PCT/US99/21874

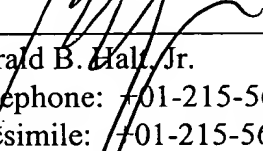
Docket No.: MOT-D2194WO

novelty, inventive step and industrial applicability requirements. In the event that a negative statement with respect to the new claims is made, Applicant respectfully requests an additional opportunity to respond pursuant to Rule 66.4(b).

If the Examiner believes that a further interview, either personal or telephonic, would facilitate allowance of the claims, he is respectfully requested to contact the undersigned.

Respectfully submitted,

General Instrument Corporation

By   
Gerald B. Hall, Jr.  
Telephone: +01-215-568-6400  
Facsimile: +01-215-568-6499

Volpe and Koenig, P.C.  
400 One Penn Center  
1617 John F. Kennedy Boulevard  
Philadelphia, PA 19103

GBH/kag  
Enclosures

and decoded at a television in order to display the ancillary information along with the television picture. Ancillary information typically includes text, for example closed captioning or related program information. Since the ancillary information transmitted along the VBI does not typically utilize the entire bandwidth assigned to the VBI, it is desirable to merge several VBIs into the bandwidth allotted for a single VBI in order to minimize the overall bandwidth required for the television transmission.

United Kingdom Patent Application No. GB 2286321A discloses a method for data distribution comprising storing packets of data in a random access memory, storing transmission characteristics for each packet, reading the characteristics and transmitting each packet to an audience in accordance with the frequency and timing parameters set forth in the packets' particular transmission characteristics. However, this system does not have the capability of merging the information from several VBIs into the bandwidth allotted for a single VBI.

## SUMMARY

It is therefore an object of the invention to provide a method and apparatus for merging VBIs into the bandwidth allotted for a single VBI.

This and other objects have been achieved by providing a method and an apparatus for merging VBIs. The VBIs are merged by sequentially writing selected VBIs of a field to a first memory, then writing selected VBIs of a second field to a second memory while reading VBIs from the first memory in a desired sequence.



What is claimed is:

1. A method for merging vertical blanking intervals comprising:

storing a plurality of lines of data from a first service in a first memory (26)

during a first write cycle;

storing a plurality of lines of data from a second service in a third memory

5 (66) during the first write cycle;

storing a second plurality of lines of data from the first service in a second

memory (30) during a second write cycle;

storing a second plurality of lines of data from the second service in a fourth

memory (68) during the second write cycle;

10 reading selected lines of the data in the second and fourth memories (30), (68)

during the first write cycle; and

reading selected lines of the data in the first and third memories (26), (66)

during the second write cycle.

2. The method of claim 1 wherein the memories (26), (30), (66), (68) are controlled by a controller (40).

3. The method of claim 2 wherein the controller (40) sends memory addresses to the memories (26), (30), (66), (68) during the write cycles to direct the data into selected memory locations.

4. The method of claim 3 wherein data is selected and read from locations in each memory (26), (30), (66), (68) according to addresses sent from the controller (40).

5. An apparatus for merging video data comprising:

a controller (40);

first (26), second (30), third (66), and fourth (68) memories, responsive to said controller (40);

5        an input address bus (45), (49) connected between the controller (40) and the memories (26), (30), (66), (68);

an output address bus connected between the controller (40) and the memories (26), (30), (66), (68);

a first service input (22) connected to the first (26) and second (30) memories;

10        and

a second service input (65) connected to the third (66) and fourth (68) memories; and an output bus (59) connected to the first (26), second (30), third (66), and fourth (63) memories.

6. The apparatus according to claim 5 further comprising a plurality of control multiplexers (28), (32), (62), (63) operatively connected to the controller (40), each for controlling a respective one of the memories (26), (30), (66), (68).

7. The apparatus according to claim 5 wherein the controller (40) comprises a field programmable gate array.

8. The apparatus according to claim 5 further comprising an output data bus (59) connected to each of the memories (26), (30), (66), (68).

9. The apparatus according to claim 8 further comprising a first output multiplexer (34) operatively connected between the first (26) and second (30) memories.

10. The apparatus according to claim 9 further comprising a second output multiplexer (64) operatively connected to the first output multiplexer (34) and between the third (66) and fourth (68) memories.

11. The apparatus according to claim 8 further comprising a first input multiplexer (24) for directing data into the first (26) and second (30) memories.

12. The apparatus according to claim 11 further comprising a second input multiplexer for directing data into the third (66) and fourth (68) memories.

13. The apparatus of claim 5 wherein said controller (40) stores data in the first (26) and third (66) memories while selectively reading data from the second (30)

and fourth (68) memories during a first cycle, and stores data in the second (30) and fourth (68) memories while selectively reading data from the first (26) and third (66) memories during a second cycle.

14. The apparatus according to claim 13 further comprising a plurality of control multiplexers (28), (32), (62), (63) operatively connected to each other and each being connected to a respective one of the memories (26), (30), (66), (68).

15. The apparatus according to claim 14 wherein said plurality of control multiplexers (28), (32), (62), (63) controls data flow in to and out of its respective memory (26), (30), (66), (68).

16. The apparatus according to claim 15 wherein said first output multiplexer (34) directs data out of the first (26) and second (30) memories to a common data bus (59).

17. The apparatus according to claim 16 wherein said second output multiplexer (64) directs data out of the third (66) and fourth (68) memories to the common data bus (59).

What is claimed is:

1. A method for merging vertical blanking intervals comprising:

storing a plurality of lines of data from a first service in a first memory (26)

during a first write cycle;

storing a plurality of lines of data from a second service in a third memory

5 (66) during the first write cycle;

storing a second plurality of lines of data from the first service in a second memory (30) during a second write cycle;

storing a second plurality of lines of data from the second service in a fourth memory (68) during the second write cycle;

10 reading selected lines of the data in the second and fourth memories (30), (68) during the first write cycle; and

reading selected lines of the data in the first and third memories (26), (66) during the second write cycle.

2. The method of claim 1 wherein the memories (26), (30), (66), (68) are controlled by a controller (40).

3. The method of claim 2 wherein the controller (40) sends memory addresses to the memories (26), (30), (66), (68) during the write cycles to direct the data into selected memory locations.

4. The method of claim 3 wherein data is selected and read from locations in each memory (26), (30), (66), (68) according to addresses sent from the controller (40).

5. An apparatus for merging video data comprising:

a controller (40);

first (26), second (30), third (66), and fourth (68) memories, responsive to said controller (40);

5            an input address bus (45), (49) connected between the controller (40) and the memories (26), (30), (66), (68);

            an output address bus connected between the controller (40) and the memories (26), (30), (66), (68);

            a first service input (22) connected to the first (26) and second (30) memories;

10           and

            a second service input (65) connected to the third (66) and fourth (68) memories; and an output bus (59) connected to the first (26), second (30), third (66), and fourth (63) memories.

6. The apparatus according to claim 5 further comprising a plurality of control multiplexers (28), (32), (62), (63) operatively connected to the controller (40), each for controlling a respective one of the memories (26), (30), (66), (68).

7. The apparatus according to claim 5 wherein the controller (40) comprises a field programmable gate array.

8. The apparatus according to claim 5 further comprising an output data bus (59) connected to each of the memories (26), (30), (66), (68).

9. The apparatus according to claim 8 further comprising a first output multiplexer (34) operatively connected between the first (26) and second (30) memories.

10. The apparatus according to claim 9 further comprising a second output multiplexer (64) operatively connected to the first output multiplexer (34) and between the third (66) and fourth (68) memories.

11. The apparatus according to claim 8 further comprising a first input multiplexer (24) for directing data into [operatively connected between] the first (26) and second (30) memories.

12. The apparatus according to claim 11 further comprising a second input multiplexer for directing data into [operatively connected between] the third (66) and fourth (68) memories.

13. [An] The apparatus of claim 5 [for merging vertical blanking intervals comprising:

first (26) and second (30) memories associated with a first service;

third (66) and fourth (68) memories associated with a second service; and

5 control means for storing] wherein said controller (40) stores data in the first (26) and third (66) memories while selectively reading data from the second (30) and fourth (68) memories during a first cycle, and [for storing] stores data in the second (30) and fourth (68) memories while selectively reading data from the first (26) and third (66) memories during a second cycle.

14 [16]. The apparatus according to claim 13 [15] further comprising a plurality of control multiplexers (28), (32), (62), (63) [being] operatively connected to each other and each being connected to a respective one of the memories (26), (30), (66), (68).

15 [20]. The apparatus according to claim 14 [19] wherein [the control means further comprises a] said plurality of control multiplexers (28), (32), (62), (63) [each for controlling] controls data flow in to and out of [each] its respective memory (26), (30), (66), (68).



16 [23]. The apparatus according to claim 15 [20] wherein [the control means further comprises a] said first output multiplexer (34) [for directing] directs data out of the first (26) and second (30) memories to a common data bus (59).

17 [24]. The apparatus according to claim 16 [23] wherein [the control means further comprises a] said second output multiplexer (64) [for directing] directs data out of the third (66) and fourth (68) memories to the common data bus (59).

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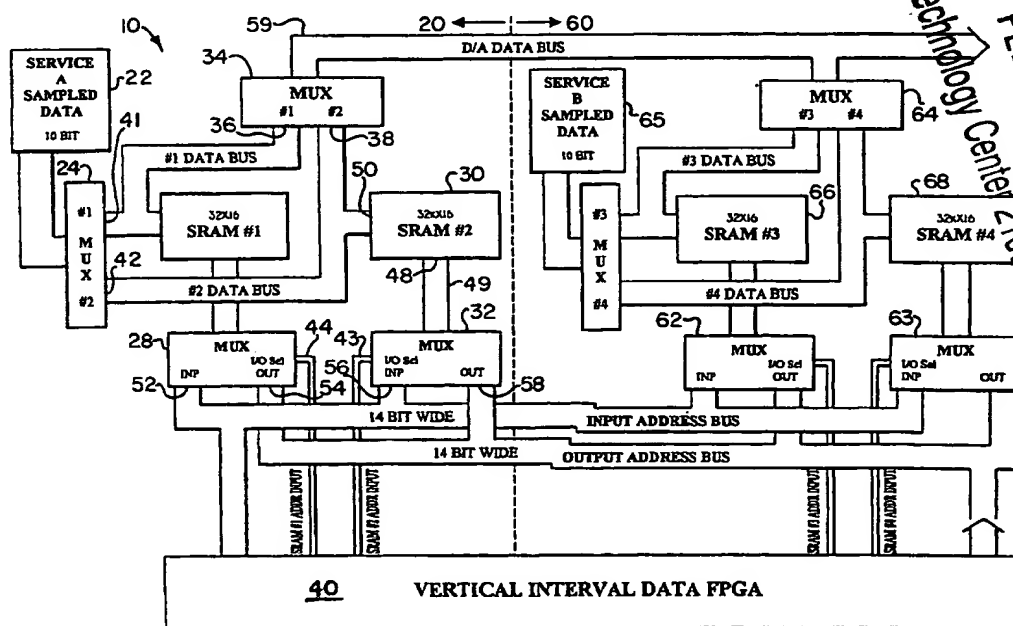
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- (71) Applicant (for all designated States except US): GENERAL INSTRUMENT CORPORATION [US/US]; 101 Tournament Drive, Horsham, PA 19044 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): CUCINOTTA, Anthony [US/US]; 1525 Latigo Hills Trail, Flower Mound, TX 75022 (US).
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(54) Title: APPARATUS AND METHOD FOR MERGING VERTICAL BLANKING INTERVALS



(57) Abstract: This invention teaches an apparatus and method for merging information transmitted in vertical blanking interval (VBIs) of several services into a single VBI. The system includes a pair of memories for each service wherein each memory is toggled between a read and write cycle. While the first memory is in a write cycle, the second memory is in a read cycle and vice versa. A field programmable gate array (FPGA) controls the first and second pairs of memory to merge the VBIs.

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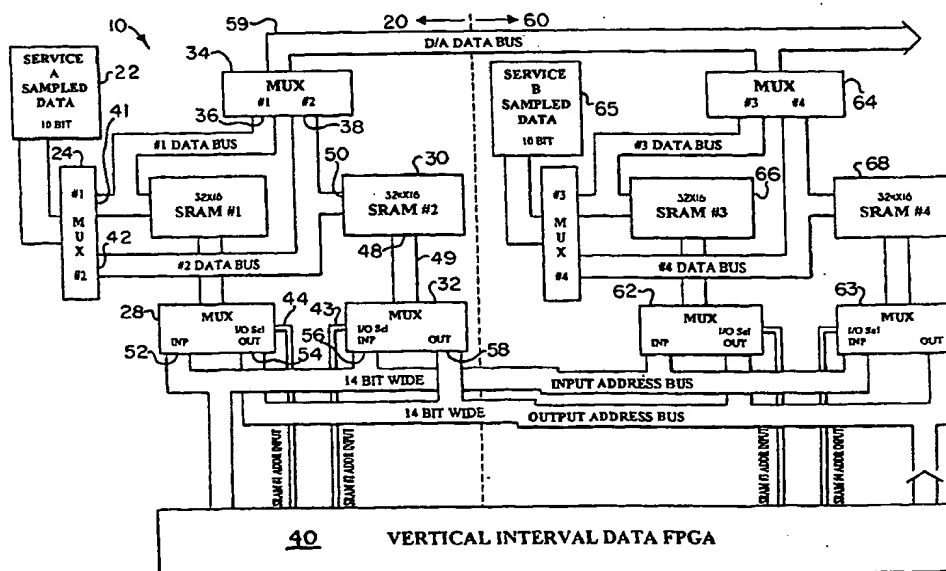
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: APPARATUS AND METHOD FOR MERGING VERTICAL BLANKING INTERVALS



## (57) Abstract

This invention teaches an apparatus and method for merging information transmitted in vertical blanking interval (VBIs) of several services into a single VBI. The system includes a pair of memories for each service wherein each memory is toggled between a read and write cycle. While the first memory is in a write cycle, the second memory is in a read cycle and vice versa. A field programmable gate array (FPGA) controls the first and second pairs of memory to merge the VBIs.

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## APPARATUS AND METHOD FOR MERGING VERTICAL BLANKING INTERVALS

### BACKGROUND

This invention is related to cable television (CATV) and wireless transmission systems. More particularly, the invention is related to an apparatus for merging selected lines of at least two vertical blanking intervals (VBIs) for transmission over the RF band which is typically reserved for a single VBI.

With the increasing array of services from CATV and wireless network operators, it has become imperative for operators to offer more services in the same amount of RF transmission bandwidth. Moreover, wireless pay television systems, whether MMDS or conventional VHF/UHF television, are generally constrained to far fewer channels than the conventional CATV systems with which they compete. The challenge is offering more channels to subscribers within the spectrum constraints imposed by government regulations.

For a typical television program, since the video portion of the program occupies most of the available 6 MHz on an NTSC television channel, much of the research toward maximizing the amount of bandwidth has been traditionally devoted towards compressing and minimizing the amount of bandwidth the video information occupies. Accordingly there exists a need for providing more channel capacity within the same amount of transmission bandwidth while maintaining the quality of the transmitted data.

Ancillary information services are typically transmitted using existing television broadcast channels. The ancillary information is transmitted in the VBI

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and decoded at a television in order to display the ancillary information along with the television picture. Ancillary information typically includes text, for example closed captioning or related program information. Since the ancillary information transmitted along the VBI does not typically utilize the entire bandwidth assigned to the VBI, it is desirable to merge several VBIs into the bandwidth allotted for a single VBI in order to minimize the overall bandwidth required for the television transmission.

### SUMMARY

It is therefore an object of the invention to provide a method and apparatus for merging VBIs into the bandwidth allotted for a single VBI.

This and other objects have been achieved by providing a method and an apparatus for merging VBIs. The VBIs are merged by sequentially writing selected VBIs of a field to a first memory, then writing selected VBIs of a second field to a second memory while reading VBIs from the first memory in a desired sequence.

This process is duplicated for a second service such that during the read intervals, data from VBIs in the first service are merged with VBIs of the second service.

## BRIEF DESCRIPTION OF THE DRAWINGS

**Figure 1** is a diagram of the merging system according to the present invention; and

**Figure 2** is a diagram VBIs from two services merged into a single VBI.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention will now be described in greater detail with reference to the drawings, wherein like numerals represent like elements throughout. The system **10** shown in **Figure 1** for merging VBIs is divided into two symmetric halves **20**, **60**. The first half **20** is connected to a first service which will be referred to as service A while the second half **60** is connected to a second service which will be referred to as service B. A field programable gate array (FPGA) **40** is connected to a microprocessor (not shown) and controls both halves **20**, **60**. The preferred FPGA **40** for this system is a QuickLogic QL3025-2 PQ208C. It should be understood however that other commercially available field programmable gate arrays or other control circuits having similar functionality may be utilized as a substitute for this component. The FPGA **40** is preferably controlled by a microprocessor on a Zilog Z8S180 circuit card. It should also be understood that other commercially available microprocessors serving similar FPGA control functions may be utilized as a substitute for this component.

The FPGA **40** is connected to an input multiplexer **24** which receives input data from service A at port **22**. The input multiplexer **24** has a first output **41**



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connected to number 1 data bus and a second output 42 connected to number 2 data bus. Both number 1 data bus and number 2 data bus are bidirectional to allow data flow in both directions. Memory 26 is connected to number 1 data bus at 46 and is controlled by the FPGA 40. It should be understood that while the memories 26 and 30 are shown as static RAM, other suitable memory devices may be utilized for this application. An address bus 45 extends from the memory 26 to a first control multiplexer 28. The first control multiplexer 28 has a first input 52 connected to the FPGA 40 and an output port 54 also connected to the FPGA 40. Input 52 is connected to a corresponding input on control multiplexers 62, 63 in the second half 60. Likewise, output port 54 is also connected to corresponding outputs on control multiplexers 62, 63 in the second half 60. A directional signal from the FPGA 40 is connected to the control multiplexer 28 at I/O select port 44. Likewise, a second directional signal from the FPGA 40 is connected to the control multiplexer 32 at I/O select port 43.

The number 1 data bus also extends to an output multiplexer 34 at port 36. The output multiplexer is connected to the number 2 data bus at port 38. A second memory 30 is connected to the number 2 data bus at port 50 and to an address bus 49 at port 48. The address bus 49 extends to a second control multiplexer 32 having an I/O select port 56 being connected to the input 52 of the first control multiplexer 28. An output port 58 is connected to the output port 54 of the first control multiplexer 28. Both ports 56 and 58 are also connected to the FPGA 40 and to corresponding control multiplexers 62, 63 in the second half 60. An output data bus

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**59** extends from the output multiplexer **34** and is coupled to a complimentary output multiplexer **64** of the second half **60**.

Operation of the system **10** will be described in greater detail with reference to **Figures 1** and **2**. Turning first to **Figure 2**, it should be understood that a pair of services each containing a series of VBI information stored along selected lines of a picture field are to be merged into a single VBI. For example, **Figure 2** shows a sample merged VBI. It can be seen that selected lines from service A and selected lines from service B are assembled into selected locations in the merged VBI. It should also be understood that, while only part of the lines displayed for service A and part of the lines for service B have been selected for the merged VBI, the merged VBI could be sized accordingly to receive all the selected lines of service A and all the selected lines of service B as long as the merged VBI does not exceed a maximum size limitation of a given television picture field. Assume, for example, that the desired information to be transmitted from service A appears on lines 10-21 of service A. Assume also, that the desired VBI information of service B appears at lines 10-21. The merged VBI can contain some of the lines from each service as shown in **Figure 2** or it may contain all of the lines 10-21 from each service. This control is achieved by programming the FPGA **40** using a microprocessor (not shown). Those reasonably skilled in the art would appreciate that while lines 10-21 have been selected in these services for transmitting data along the VBI, other lines could be selected for transmitting the same data.

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Referring back to **Figure 1**, service A is sampled at a desirable sample rate, for example this system utilizes 909 samples per video line, however it should be understood that other sample rates may be selected based upon design requirements or preferences. Service A sample data **22** is fed into the input multiplexer **24**. The FPGA **40** controls the input multiplexer **22** to send the sample data either to port **41** along number 1 data bus or port **42** along number 2 data bus. The FPGA **40** controls each memory **26**, **30** so that, while memory **26** is receiving data from the input multiplexer **22** along number 1 data bus (write cycle), memory **30** is being read from port **50** along the number 2 data bus (read cycle) and vice versa. Therefore, VBI lines corresponding to a given field and sampled at a rate of 909 samples per line are written into memory **26** while a series of lines from the previous field having been stored in a similar fashion are being read from the memory **30**.

Each of the memories **26**, **30** are controlled through a respective control multiplexer **28**, **32**. The FPGA **40** sends input addresses along the input address bus through input **52** and address bus **45** to the memory **26** to indicate where each consecutive sample for the series of VBI lines is to be stored. These addresses are preferably sequential addresses, however it should be understood that the FPGA **40** may be programmed to control the memory **26** so that samples are stored in a non-sequential manner. Data is read from the memory **26** in the following cycle along number 1 data bus. Data is read from the memory **26** according to addresses sent by the FPGA **40** along the output address bus to output port **54**. The data is read out of the memory in a non-sequential order as directed by addresses sent from the FPGA

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40 through output port 54 of the control multiplexer 28. For example, as shown in **Figure 2**, data written in from line 18 of service B could be read out at line 12 in the merged VBI. The FPGA 40 could optionally be programmed to send addresses to the memory 26 such that data is read out sequentially. The data in the form of sampled VBIs is read along number 1 data bus into port 36 of the output multiplexer 34 and on to the output data bus 59. It should be understood that during a first cycle, the number 2 data bus has data flowing from the input multiplexer 24 into the memory 30 and there is no data flowing into port 38 of the output multiplexer 34. During the next cycle, data is read from the memory 30. The output data bus therefore receives non-sequential VBI line data corresponding to a first field from memory 26 and then receives non-sequential VBI data from a second field from memory 30. It should be understood however that the FPGA 40 could be programmed to read data out in any order including a sequential order. This process is duplicated for service B in system half 60. The processes are synchronized so that when memory 26 is in a read cycle, memory 66 is also in a read cycle. Accordingly, when memory 30 is in a read cycle, memory 68 is also in a read cycle. The same applies to memories 26 and 66. Write cycles are similarly synchronized. The output data bus 59 therefore receives some line samples from output multiplexer 34 and some line samples from output multiplexer 64 to create the merged VBI shown in **Figure 2**. The FPGA 40 controls the selection of lines from each service. Therefore, for each line of the merged VBI, (**Figure 1**) the FPGA 40 selects the service and line number from data previously stored in the memories.

An advantage of this invention is that several services VBIs may be transmitted in a single VBI thus reducing the bandwidth necessary for transmission.

It will be understood by those reasonably skilled in the art that minor variations of the embodiment presented here are intended to be within the scope of the invention. For example, where reference is made to sampling or digitizing data, it should be appreciated that similar analog methods could be substituted. Other such minor variations are intended to be within the scope of the invention which is intended to be limited only by the appended claims.

What is claimed is:

1. A method for merging vertical blanking intervals comprising:

storing a plurality of lines of data from a first service in a first memory during  
a first write cycle;

storing a plurality of lines of data from a second service in a third memory  
5 during the first write cycle;

storing a second plurality of lines of data from the first service in a second  
memory during a second write cycle;

storing a second plurality of lines of data from the second service in a fourth  
memory during the second write cycle;

10 reading selected lines of the data in the second and fourth memories during  
the first write cycle; and

reading selected lines of the data in the first and third memories during the  
second write cycle.

2. The method of claim 1 wherein the memories are controlled by a  
controller.

3. The method of claim 2 wherein the controller sends memory addresses to  
the memories during the write cycles to direct the data into selected memory  
locations.

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4. The method of claim 3 wherein data is selected and read from locations in each memory according to addresses sent from the controller.

5. An apparatus for merging video data comprising:

a controller;

first, second, third, and fourth memories;

an input address bus connected between the controller and the memories;

an output address bus connected between the controller and the memories;

a first service input connected to the first and second memories; and

a second service input connected to the third and fourth memories; and an output bus connected to the first, second, third, and fourth memories.

6. The apparatus according to claim 5 further comprising a plurality of control multiplexers operatively connected to the controller each for controlling a respective one of the memories.

7. The apparatus according to claim 5 wherein the controller comprises a field programmable gate array.

8. The apparatus according to claim 5 further comprising an output data bus connected to each of the memories.

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9. The apparatus according to claim 8 further comprising a first output multiplexer operatively connected between the first and second memories.

10. The apparatus according to claim 9 further comprising a second output multiplexer operatively connected between the third and fourth memories.

11. The apparatus according to claim 8 further comprising a first input multiplexer operatively connected between the first and second memories.

12. The apparatus according to claim 11 further comprising a second input multiplexer operatively connected between the third and fourth memories.

13. An apparatus for merging vertical blanking intervals comprising:

first and second memories associated with a first service;

third and fourth memories associated with a second service; and

control means for storing data in the first and third memories while selectively reading data from the second and fourth memories during a first cycle and for storing data in the second and fourth memories while selectively reading data from the first and third memories during a second cycle.

14. The apparatus according to claim 13 further comprising a first input multiplexer connected to the first and second memories.



15. The apparatus according to claim 14 further comprising a second input multiplexer connected to the third and fourth memories.

16. The apparatus according to claim 15 further comprising a plurality of control multiplexers being operatively connected to each other and each being connected to a respective one of the memories.

17. The apparatus according to claim 16 comprising a first output multiplexer connected to the first and second memories.

18. The apparatus according to claim 17 comprising a second output multiplexer connected to the first output multiplexer and connected to the third and fourth memories.

19. The apparatus according to claim 14 wherein the control means comprises a field programmable gate array.

20. The apparatus according to claim 19 wherein the control means further comprises a plurality of control multiplexers each for controlling data flow in to and out of each memory.

21. The apparatus according to claim 20 wherein the control means further comprises a first input multiplexer for directing data into the first and second memories.

22. The apparatus according to claim 21 wherein the control means further comprises a second input multiplexer for directing data into the third and fourth memories.

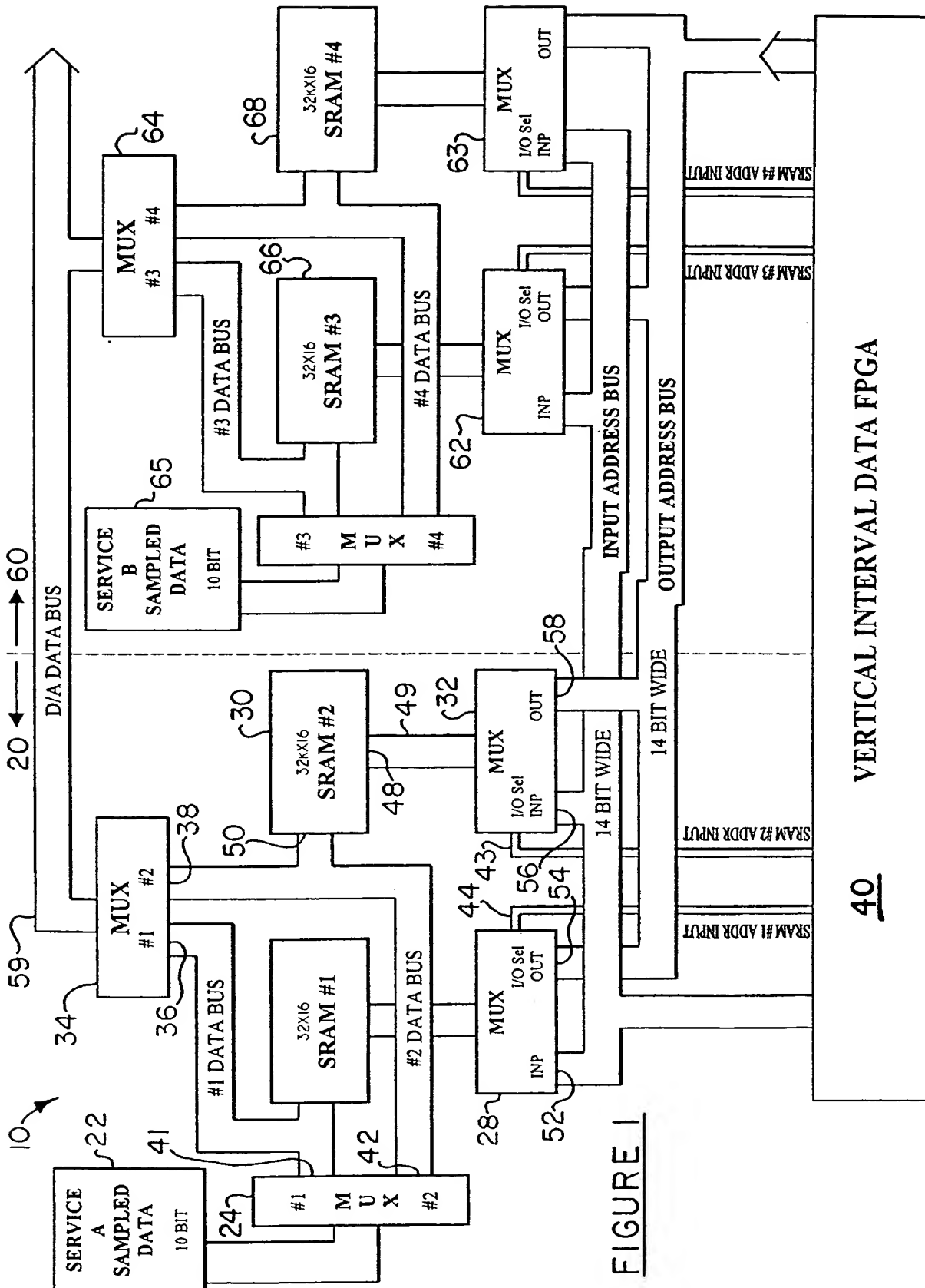
23. The apparatus according to claim 20 wherein the control means further comprises a first output multiplexer for directing data out of the first and second memories to a common data bus.

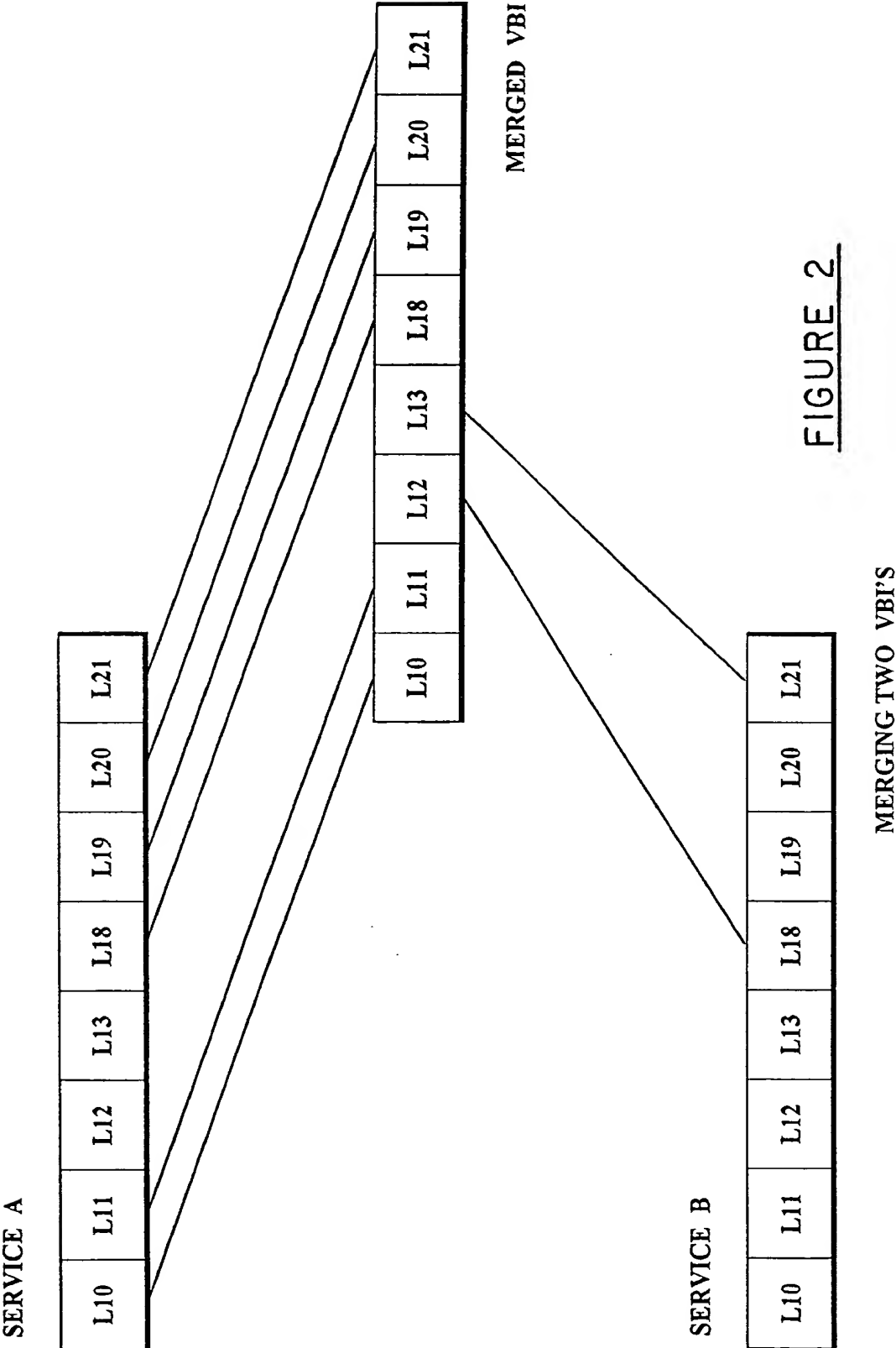
24. The apparatus according to claim 23 wherein the control means further comprises a second output multiplexer for directing data out of the third and fourth memories to the common data bus.

\*

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/21874

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04N7/088

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                        | Relevant to claim No. |
|------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A          | GB 2 286 321 A (VIDEOTRON GROUPE LTEE)<br>9 August 1995 (1995-08-09)<br>page 2, line 18 -page 4, line 12; figure 1<br>--- | 1,5,13                |
| A          | EP 0 018 783 A (WESTINGHOUSE ELECTRIC<br>CORP) 12 November 1980 (1980-11-12)<br>figure 1<br>-----                         | 5                     |

☐ Further documents are listed in the continuation of box C.



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Beaudoin, O

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| GB 2286321 A                              | 09-08-1995          | US 5524001 A               | 04-06-1996          |
|                                           |                     | CA 2140969 A               | 08-08-1995          |
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|                                           |                     | JP 55143883 A              | 10-11-1980          |

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                             |                                                                                                                                                         |                                                                         |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Applicant's or agent's file reference<br><b>GIC-PT079PC</b> | <b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. |                                                                         |
| International application No.<br><b>PCT/US 99/ 21874</b>    | International filing date ( <i>day/month/year</i> )<br><b>21/09/1999</b>                                                                                | (Earliest) Priority Date ( <i>day/month/year</i> )<br><b>21/09/1998</b> |
| Applicant<br><br><b>GENERAL INSTRUMENT CORPORATION</b>      |                                                                                                                                                         |                                                                         |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

T/US 99/21874

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04N7/088

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages                                          | Relevant to claim No. |
|------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A          | GB 2 286 321 A (VIDEOTRON GROUPE LTEE)<br>9 August 1995 (1995-08-09)<br>page 2, line 18 -page 4, line 12; figure 1<br>----- | 1,5,13                |
| A          | EP 0 018 783 A (WESTINGHOUSE ELECTRIC<br>CORP) 12 November 1980 (1980-11-12)<br>figure 1<br>-----                           | 5                     |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## ° Special categories of cited documents :

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"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

20 January 2000

Date of mailing of the international search report

26/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Beaudoin, O



## INTERNATIONAL SEARCH REPORT

International Application No

Information on patent family members

PCT/US 99/21874

| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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|                                           |   |                     | NL 9500180 A               | 01-09-1995          |
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